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COMPLIANCE MONITORING PLAN

8801 East Marginal Way S.

TUKWILA, WASHINGTON
AGREED ORDER 6069

SHANNON & WILSON

March 15, 2021

Shannon & Wilson No: 21-1-12567-024

Submitted To: PACCAR Inc

Subject: FINAL COMPLIANCE MONITORING PLANREPORT TYPE, 8801 EAST MARGINAL WAY S, TUKWILA, WASHINGTON
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Shannon & Wilson prepared this report and participated in this project as a consultant to PACCAR Inc. This report presents the Compliance Monitoring Plan for the property at 8801 East Marginal Way S., Tukwila, Washington, and was prepared by the undersigned.

This compliance monitoring plan fulfills the requirements of Task 2C within the schedule given in Exhibit C of Agreed Order number 6069 dated September 2008. This report is also a companion document for the engineering design reports that fulfill the requirements of Task 2C of Agreed Order number 6069.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or we may be of further service, please contact us.

Sincerely,

SHANNON & WILSON

Meg Strong, LG, LHG
Vice President

BON:MJS/bon:jxs:mjs

EXECUTIVE SUMMARY

This report details the protection, performance, and confirmation monitoring to be conducted during remedial actions at the upland portion of the 8801 East Marginal Way South site in Tukwila, Washington (8801 site). The upland portion of the 8801 site is referred to as the 8801 property. Contaminated soil and groundwater are present on the 8801 property. Soil, groundwater, and air will be monitored during and following remedial action activities. The monitoring will be used to determine if remedial action objectives detailed in the Final Feasibility Study, Final Interim Action Work Plan, and Addendum to Feasibility Study and Interim Action Work Plan (Shannon & Wilson, 2020a, 2020b, and 2020c) have been achieved. The following compliance monitoring is planned:

Protection Monitoring

Protection monitoring includes:

- Personal and perimeter air monitoring during remedial excavations.
- Implementation of construction stormwater Best Management Practices (BMPs).

Performance Monitoring

Performance monitoring includes:

- Obtaining sidewall and base samples from remedial excavations.
- Sampling downgradient groundwater monitoring wells following remedial excavation and injection work.
- Sampling vapor from the sub-slab beneath the new warehouse proposed for construction on the 8801 property.

Confirmation Monitoring

Confirmation monitoring includes:

- Sampling of compliance groundwater monitoring wells.

An institutional control in the form of an environmental covenant will be established for the 8801 property to ensure that maintenance of the asphalt/concrete cover is undertaken to reduce stormwater infiltration and potential leaching of the soil chemicals of concern (COCs) into groundwater, to ensure that groundwater is not used as drinking water, to ensure that users of the 8801 property are protected from vapors and new buildings are

assessed for potential vapor mitigation requirements, and to ensure the clay cap and drainage layer installed along the shoreline are inspected and maintained, as necessary.

This plan is a companion document to engineering design reports (EDRs) that provide additional details and design of the remedial actions that will be undertaken. The companion EDR documents address eight hotspot excavations (two separate documents), groundwater injections, modifications to and extension of the air sparge and soil vapor extraction (AS/SVE) system, caulk removal, and a sub-slab depressurization system.

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ACRONYMS

8801 property	upland portion of the 8801 site
8801 site	8801 East Marginal Way South site
Addendum	Addendum to the Feasibility Study and Interim Action Work Plan
AO	Agreed Order
AS/SVE	air sparge/soil vapor extraction
bgs	below ground surface
BMPs	Best Management Practices
CenterPoint	CenterPoint 8801 Marginal LLC
CMP	Compliance Monitoring Plan
COCs	chemicals of concern
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
CUL	cleanup level
DAHP	Department of Archaeology and Historic Preservation
Ecology	Washington State Department of Ecology
EDR	engineering design report
ERD	enhanced reductive dechlorination
HASP	Health and Safety Plan
IAWP	Interim Action Work Plan
IDMP	inadvertent discovery monitoring plan
LDW	Lower Duwamish Waterway
MSL	mean sea level
MTCA	Model Toxics Control Act
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
POCs	points of compliance
PQL	practical quantitation limit
RAOs	remedial action objectives
RL	remediation level
TCE	trichloroethene
TEQ	toxicity equivalent quotient
TESC	temporary erosion and sedimentation control
TPH	total petroleum hydrocarbons
VOCs	volatile organic compounds
WAC	Washington Administrative Code

1 INTRODUCTION

This Compliance Monitoring Plan (CMP) provides the information necessary to complete protection, performance, and compliance monitoring associated with the remedial actions described in the Final Feasibility Study (Shannon & Wilson, 2020a), Final Interim Action Work Plan (Shannon & Wilson, 2020b), and Addendum to the Feasibility Study and Interim Action Work Plan (Addendum) (Shannon & Wilson, 2020c). The Final Interim Action Work Plan and Addendum together constitute the Interim Action Work Plan (IAWP). In this CMP, a Sampling and Analysis Plan is provided in Appendix A, a Health and Safety Plan (HASP) is provided in Appendix B, and the archeological inadvertent discovery monitoring plan (IDMP) is provided in Appendix C.

The 8801 site is located at 8801 East Marginal Way South in Tukwila, Washington (Figure 1). The 8801 site consists of an upland portion (the 8801 property) and the adjoining sediments in the Lower Duwamish Waterway (LDW). The 8801 site is subject to two separate Agreed Orders (AOs): AO No. 6069, which applies to the 8801 property, and AO No. 3599, which applies to the adjoining LDW sediments. This CMP fulfils the requirements of Task 2C of the schedule provided in Exhibit C of AO No. 6069 for the 8801 property, and is a companion report to the EDR documents. The EDRs address eight hotspot excavations (two separate documents), groundwater injections, modifications to and extension of the AS/SVE system, caulk removal, and a sub-slab depressurization system.

2 SITE DESCRIPTION

This section presents a brief overview of the 8801 property's location, history, geology, and hydrogeology. Additional information is provided in the IAWP.

2.1 Physical Description and Use

The 8801 property occupies 24.30 acres on the east bank of the LDW and is relatively flat, with a ground surface elevation of approximately 20 feet above mean sea level (MSL).

The property owner, CenterPoint 8801 Marginal LLC (CenterPoint), plans to redevelop the 8801 property. The redevelopment is slated to commence in 2021. The redevelopment plans include demolition of the existing buildings, except part of the smaller warehouse on the west end of the 8801 property that houses the aboveground infrastructure for the existing AS/SVE remediation system. Redevelopment plans include construction of an approximately 414,400-square-foot warehouse for industrial use and trailer storage. The

design of the warehouse includes importing fill to raise the floor level approximately 4 feet above existing grade to allow direct truck loading. The footprint of the proposed warehouse relative to existing buildings and monitoring wells is shown in Figure 2.

2.2 Geology

The 8801 property is currently paved. Fill material underlies paved surfaces and is up to 10 feet thick in some locations. Fill material includes gravelly structural fill beneath buildings and paved areas, poorly graded sand to silty sand fill deposits, and gravelly backfill materials in excavations. Fill material at the 8801 property is underlain by a layer of fine-grained material, including silt, sandy silt, and silty sand that extends to a depth of 5 to 15 feet below ground surface (bgs). A poorly graded sand layer, which typically contains less than 10% silt, is generally present beneath the fine-grained layer beginning at 10 to 15 feet bgs, although at some locations it is present immediately beneath the pavement surface or the fill material. A layer of fine-grained materials, consisting mainly of silt and silty sand, is typically present beneath the poorly graded sandy layer at depths of approximately 30 to 50 feet bgs. This fine-grained silty material acts as a confining layer to groundwater flow on the western part of the 8801 property. The lower fine-grained layer is typically underlain by poorly graded sand to the maximum depth explored at the 8801 property (60 feet bgs).

2.3 Hydrogeology

Results of groundwater monitoring at the 8801 property indicate that the shallow aquifer is typically 8 to 10 feet bgs. Results of tidal influence analyses indicate that the maximum tidal fluctuation at the western boundary of the 8801 property ranges from -3.03 feet relative to MSL to +1.85 feet MSL in the southern portion of the 8801 property, where riprap demarcates the 8801 property boundary. Farther north, where the sheet piling bulkhead demarcates the 8801 property boundary, the maximum tidal fluctuation ranges between -1.80 feet MSL and +1.32 feet MSL.

The hydraulic gradient in the shallow aquifer is generally towards the west. Groundwater velocity is estimated to be 40 feet per year.

3 CLEANUP STANDARDS AND REMEDIATION LEVELS

This section discusses the cleanup levels (CULs) that are protective of human health and the environment, the remediation levels used for soil and halogenated volatile organic compounds (VOCs) in groundwater, and the points of compliance (POCs) where those

CULs apply. The CULs for soil, groundwater, and air at the 8801 property are based on unrestricted land use and are shown in Table 1.

3.1 Soil Cleanup Levels (CULS)

For COCs in soil, the CULs are primarily the soil leaching CUL, background, practical quantitation limits (PQLs) or the Model Toxics Control Act (MTCA) Method B value for human health direct contact as discussed by chemical below. The more widespread soil COCs include trichloroethene (TCE), tetrachloroethene (PCE), vinyl chloride, bis(2-ethylhexyl)phthalate, total carcinogenic polyaromatic hydrocarbons (cPAHs) corrected for total equivalency quotient (TEQ), and total polychlorinated biphenyl (PCB) aroclors. More localized occurrences of soil COCs include arsenic, cadmium, chromium, copper, lead, gasoline-range hydrocarbons, oil-range hydrocarbons, and dioxin/furan TEQ.

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TCE, PCE, and vinyl chloride are currently partitioning from soil as concentrations in groundwater exceed the CUL. Therefore, the CULs selected for these three COCs are based on a value that is protective of transport to surface water via groundwater based on non-potable groundwater in either the saturated or unsaturated soil as appropriate. The CULs for TCE and vinyl chloride in soil are corrected to the PQLs achievable by analytical laboratories.

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Soil CULs for bis(2-ethylhexyl)phthalate, cPAHs TEQ, and PCBs are also based on soil leaching CULs. The CULs for bis(2-ethylhexyl)phthalate, cPAHs, and PCBs in soil are corrected to the PQLs achievable by analytical laboratories.

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The soil CULs for TCE, PCE, vinyl chloride, bis(2-ethylhexyl)phthalate, cPAHs, and PCBs are so low that compliance with soil CULs for these COCs will be based not on the concentration of these COCs in soil, but in groundwater, which is appropriate because the soil CULs are based on protection of groundwater. Attaining the groundwater CULs for these COCs will serve as proof that the soil is not or is no longer contributing COCs to the groundwater at a level that causes exceedance of the groundwater CUL.

Arsenic, copper, and dioxin/furan TEQ soil CULs are based on background concentrations. Cadmium and chromium soil CULs are based on protection of bank erosion and these criteria are only applicable for these chemicals in the southwest storage area as the concentrations of the two metals are below the more stringent CULs elsewhere on the 8801 property.

Lead is not present in groundwater above the CUL; therefore, the soil CUL is based on MTCA Method B for direct contact. Gasoline- and oil-range hydrocarbons are present in groundwater in only one location. Therefore, the gasoline-range hydrocarbons soil CUL is

based on protection for indoor air where the proposed warehouse overlies a sample with an exceedance. MTCA Method A residual concentration CUL is used for oil-range hydrocarbons.

3.2 Soil Remediation Levels (RLs)

The soil remediation levels have been developed in accordance with Washington Administrative Code (WAC) 173-340-355 (Ecology, 2013), and take into consideration the expectations for cleanup alternatives in WAC 173-340-370. The soil remediation levels that have been selected will ensure that the areas that have significant mass of COCs will be removed.

Due to the stringent values required to ensure that soil is protective of the leaching pathway, soil RLs are being used to delineate the limits of the remedial excavations except in Area 5 where cadmium and chromium CULs will be used and Areas 7 and 8 where the gasoline-range hydrocarbon CULs will be used. The soil RLs and COCs are shown in Table 2.

A disproportionate cost analysis and calculations performed as a part of the IAWP determined that using soil RLs to guide the remedial excavations would result in a 66% mass reduction of PCB aroclors, 63% mass reduction of cPAH TEQ, 65% mass reduction of arsenic, 91% mass reduction of copper, and 81% mass reduction of TCE.

The goal of the remedial excavations is to remove soil above the RLs in the selected excavation areas, and soil exceeding a COC-specific CUL may remain in place if appropriate soil RLs have been achieved at the extent of the excavations.

3.3 Groundwater RLs and Cleanup Levels (CULs)

In groundwater, CULs for total cPAHs TEQ, total PCB aroclors, TCE, vinyl chloride, copper, and arsenic are discussed in detail below. This subset is discussed because those COCs are the primary drivers for remedial action in groundwater. The groundwater CULs for the COCs discussed below, as well as other site-specific CULs established in the IAWP, are provided in Table 1. The most stringent CULs for groundwater are based primarily on protection of surface water (consumption of organisms) and protection of sediments. Copper and arsenic are also discussed because they are being mobilized from the soil primarily due to the breakdown of TCE and vinyl chloride.

Total cPAHs TEQ and total PCB aroclors. The CULs for total cPAHs TEQ and total PCB aroclors in groundwater are extremely stringent (parts per trillion) and are not currently achievable by laboratories. For this reason, the CULs for both chemicals are based on the

laboratory PQLs for PCB aroclors (by EPA Method 8082A) and cPAH TEQ (by EPA Method 8270 SIM). PCBs are only sometimes detected above the PQLs at one of the compliance wells, MW-30A, and cPAHs are only sometimes detected above the PQLs at two of the compliance wells, MW-30A and MW-37A. It is expected that after the remedial excavations, the groundwater concentration will drop below the CULs at all conditional point of compliance wells. Because the CULs for cPAHs and PCBs in groundwater are set at the PQL, which is the lowest concentration that can reliably be measured by the analysis, the timelines referenced are conservative to account for future improvements in laboratory technology, which may lower the PQL allowing for detections of these contaminates at lower concentrations.

TCE and Vinyl Chloride. Calculations undertaken using the BIOCHLOR model as discussed in the Final Feasibility Study (Shannon & Wilson, 2020a) demonstrate that halogenated VOCs are naturally degrading. TCE and vinyl chloride are targeted in the groundwater because lowering these values will lower other associated halogenated VOCs. RLs for TCE and vinyl chloride are being used to achieve groundwater targets that will achieve CULs within the 8801 property. Once RLs are achieved, the halogenated VOCs will naturally break down further and will be aided by the air sparge system such that they will be protective of surface water (e.g. less than or equal to groundwater CULs) by the time the groundwater reaches the compliance wells. Based on the BIOCLOR model various RLs are required in different parts of the groundwater plume (see Figure 4); more stringent RLs are required to be achieved to the west, whereas less stringent RLs are required to be achieved to the east. This is because in the east there is greater distance to travel before reaching the LDW and more time for concentrations to naturally decline than further west. Therefore, the RLs become more stringent the further west in the plume the performance well is located on the 8801 property. TCE and vinyl chloride RLs for the west and east locations are shown in Table 3.

Copper and Arsenic. Copper and arsenic present in soil is likely being mobilized by the anaerobic conditions generated by the dechlorination of the halogenated VOCs and hydrocarbon breakdown. As the dechlorination decreases, the groundwater condition will stabilize, and copper and arsenic will re-precipitate out of groundwater as demonstrated by the 2019 groundwater sampling event results (Shannon & Wilson, 2021). The cleanup values for copper and arsenic in groundwater are based on a background concentration established at the Boeing Plant 2 property and are 8 micrograms per liter for both chemicals (Floyd Snider, 2011).

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3.4 Indoor Air Cleanup Levels (CULs)

Indoor air CULs are provided in Table 1. These values are based on unrestricted use.

3.5 Point of Compliance (POC)

MTCA defines the POC as the point or points at which CULs must be attained. The POC applies to all soil, groundwater, or air at or adjacent to any location where releases of hazardous substances have occurred or that has been impacted by releases from the location. The primary affected media at the 8801 property are soil and groundwater. The inhalation pathway is also significant for the 8801 property due to the presence of halogenated VOCs in soil and groundwater.

3.5.1 Soil

The POC demonstrating compliance for pathways protective of human health, namely potential direct contact, inhalation, or ingestion of impacted soil, shall be established in the soil throughout the 8801 property from the ground surface to 15 feet bgs (WAC 173-340-740(6)(d)).

The POC demonstrating protection of groundwater shall be established in soil throughout the 8801 property (WAC 173-340-740(6)(b)). The 8801 property will be covered by the new warehouse, paving, or a clay layer which will reduce infiltration of surface water into unsaturated soil. If soil leaching CULs are not met, empirical evaluations of contaminant concentration trends may be needed to demonstrate that soil concentrations are protective of groundwater.

The POC demonstrating compliance for pathways protective of human health and the environment by migration of chemicals from soil to air shall be established in the soil from the ground surface to the top of the uppermost saturated zone throughout the 8801 property (i.e., the Vadose zone) (WAC 173-340- 740(6)(c)).

3.5.2 Groundwater

Groundwater CULs are based on indoor air protection or protection of discharge to surface water of the LDW. MTCA regulations favor permanent cleanup of groundwater contamination at the standard POC (i.e., throughout the site). A standard POC for groundwater, as described in WAC 173-340-720(8)(b), would include all groundwater in the saturated zone beneath the 8801 property and in any area affected by contamination.

However, the Washington State Department of Ecology (Ecology) has approved the use of a conditional POC under WAC 173-340-720(8)(c) because it is not practicable to attain the standard POC throughout the full extent of the 8801 property due to the stringency of the CULs for total cPAH TEQ and total PCB aroclors. Although the cPAH and PCB groundwater CUL in this CMP are based on the laboratory PQLs, the current PQLs are

orders of magnitude higher than the CUL calculated to be protective of surface water. As analytical methods improve, the PQL will move lower (closer to the value protective of surface water) and detectable cPAHs and PCBs may be encountered. These detections will result in additional groundwater sampling and increase the timeline before compliance is achieved. It is not possible with certainty to state the amount of time before the CULs are achieved at the 8801 property because the presence of these chemicals is not yet able to be measured. For this reason, it will likely be multiple decades before the 8801 property will be in compliance and, as such, the standard POC (i.e., throughout the site) cannot be achieved in a reasonable restoration timeline.

The conditional POC will be located on the western boundary of the 8801 property. In the south of the 8801 property, this point is immediately west of the area where cPAHs and PCB containing soil will be excavated and removed and therefore is as close as practicable to the source of the release. Concentrations of total cPAHs TEQ have declined as soil hydrocarbon contamination has naturally degraded. However, total cPAHs TEQ across the 8801 property have been identified in groundwater at concentrations that are below laboratory reporting limits and yet may be above the CUL (set as PQL). Therefore, the western boundary of the 8801 property is as close as practicable to the source of the release since it is not possible to identify which wells exceed the CUL.

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Groundwater CULs will apply at the conditional POC and downgradient of that location. Groundwater upgradient of the conditional POC, but within the 8801 site, will not be required to meet CULs within a reasonable time frame as long as conditions in WAC 173-340-720(8)(c) are met.

3.5.3 Air

The POC demonstrating compliance for pathways protective of air will be air throughout the 8801 property (WAC 173-340-750(6)). Per WAC 173-340-750(1)(a), the cleanup standard applies to ambient outdoor air and air within a building, manhole, utility vault, or any structure large enough for a person to fit into.

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4 DESCRIPTION OF REMEDIAL ACTIONS

The IAWP (Shannon & Wilson, 2020b and 2020c) presents detailed descriptions of the remedial action objectives (RAOs) and remedial actions selected for the 8801 property. This section summarizes the RAOs and remedial actions.

4.1 Remedial Action Objectives (RAOs)

The RAOs are medium-specific goals for the protection of human health and the environment. RAOs form the basis for developing and evaluating remedial actions. The RAOs are:

- Protect current and future worker exposure to soil contaminants.
- Protect workers occupying future buildings.
- Allow for landscaping to be established within the 100-foot river buffer located along the western edge of the 8801 property.
- Protect current and future beneficial use of surface water and sediments in the LDW by attaining groundwater CULs before groundwater migrates to the LDW.
- Achieve the groundwater CULs for the halogenated VOC plume within a reasonable time frame.

4.2 Summary of Remedial Action

The remedial actions selected in the IAWP meet the MTCA threshold requirements (WAC 173-340-360(2)(a)) and other MTCA requirements (WAC 173-340-360(2)(b)). Selected remedial actions are shown in Figure 4 and presented below.

4.2.1 Soil Remedial Actions

The remedial actions selected for soil address saturated and unsaturated soil at the 8801 property that contain COCs at concentrations above the CULs. Primary COCs for soil are PCBs, cPAHs, and copper.

The remedial actions include:

- Excavate and remove soil containing COCs at concentrations exceeding their RLs,
- Within the 100-foot river buffer place a clay cap and overlying drainage layer, and
- Implement institutional controls to prevent leaching or exposure to COCs in subsurface soil and ensure clay cap and drainage layer inspection and maintenance.

4.2.2 Groundwater Remedial Actions

The remedial actions selected for groundwater address groundwater at the 8801 property that contains COCs at concentrations above the CULs and potential source material, including TCE-impacted soil, gasoline-impacted soil, and PCB-containing caulk and associated concrete. These remedial actions also include controls for potential effects to indoor air from the TCE groundwater plume. Primary COCs for groundwater are TCE, vinyl chloride, and PCBs.

The remedial actions include:

- Excavate and remove soil containing TCE and gasoline at concentrations exceeding their RLs,
- Apply enhanced reductive dechlorination (ERD) across the TCE/vinyl chloride plume and in the northwest area,
- Expand the AS/SVE system,
- Relocate monitoring wells,
- Remove PCB-containing caulk and associated concrete, and
- Implement institutional controls to restrict extraction of groundwater and protect indoor air from vapor.

The institutional controls will comply with the Uniform Environmental Covenants Act, Chapter 64.70 of the Revised Code of Washington.

5 COMPLIANCE MONITORING

This section discusses the compliance monitoring that will be undertaken to demonstrate compliance with the requirements detailed in this CMP and MTCA.

Three types of compliance monitoring are identified for remedial actions performed under MTCA (WAC 173-340-410): Protection, Performance, and Confirmation Monitoring. The definition of each is presented below (WAC 173-340-410(1)):

- Protection Monitoring – To confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of the remedial action as described in the safety and health plan.
- Performance Monitoring – To confirm that the remedial action has attained cleanup standards and other performance standards, such as construction quality control measurements or monitoring necessary to demonstrate compliance with a permit or, where a permit exemption applies, the substantive requirements of other laws.
- Confirmation Monitoring – To confirm the long-term effectiveness of the remedial action once cleanup standards and other performance standards have been attained.

The remedial actions performed at the 8801 property will involve all three types of monitoring. Each type of monitoring is discussed below.

5.1 Protection Monitoring

A HASP for the remedial action that meets the minimum requirements for such a plan identified in federal (29 Code of Federal Regulations 1910.120 and 1926) and state (WAC

296) regulations is included as Appendix B. The protection monitoring will include personal and perimeter air sampling for lead, PCE, TCE, and vinyl chloride during earthworks. The frequency of sampling and period for personal monitoring is established in the HASP.

While conducting fieldwork, field personnel will identify an immediate work zone around their work area. This zone will be demarcated with tape or cones to ensure nobody accidently enters the work zone.

The remedial excavations may be undertaken concurrent with redevelopment of the 8801 property. CenterPoint has already prepared a temporary erosion and sedimentation control (TESC) plan, including BMPs, for the development project, and will obtain a construction stormwater permit. The TESC and construction stormwater permit can cover the remedial excavations too.

If the remedial excavations are not implemented concurrent with the redevelopment activities, then a TESC and construction stormwater permit specific to the remedial excavations will be necessary. A TESC specific to the remedial excavations would require silt fences around excavation areas, diversion of stormwater sheet flow away from the excavations, and may require inlet protection, covering of stockpiles, straw wattles to retain stockpile coverage in place, and other appropriate BMPs. Selected BMPs would be inspected daily before remedial work commences to ensure proper condition and installation. If any deficiency in the TESC requirements is observed, a repair or replacement would be made immediately.

5.2 Performance Monitoring

The objectives for performance monitoring are to demonstrate compliance with MTCA and to document the property conditions upon completion of the remedial action. To demonstrate compliance, the following separate performance monitoring activities are planned during implementation of the IAWP:

- Create a waste profile for off-site treatment or disposal,
- Confirm that RLs have been achieved within the sidewalls and bottom of hotspot excavations,
- Determine the suitability of imported fill material and compaction,
- Prepare for encountering archaeological artifacts,
- Monitor sub-slab vapor in the proposed new warehouse,
- Monitor the performance of the AS/SVE system, and ERD injections, and

- Monitor groundwater to determine if completed groundwater and soil remedial actions have attained groundwater CULs at the conditional POC.

5.2.1 Waste Profile for Off-Site Treatment or Disposal

Wastes generated during the implementation of the remedial actions will require characterization and profiling before shipment off site. Usually, the receiving facility specifies the minimum number of samples and analytical tests. Excavation, transport, dewatering, and other technical details of excavation are provided in EDRs. Waste that will be generated during the remedial actions will include:

- Excavated soil. Past characterization has identified that much of the soil and groundwater is non-hazardous. Stockpile sampling may be undertaken in advance of off-site disposal. If necessary, a leaching test will be performed to ensure that the correct disposal facility is identified.
- Soil cuttings generated during drilling, purge water from sampling, and by-products from injections. Samples will be collected from drums for waste characterization.
- Emissions generated during operation of the AS/SVE system. After the system has been extended and is operating, sampling of the concentration and measurement of the volume of air being discharged from the system will be undertaken to determine if a permit for discharge is required.

Each waste stream will be profiled in accordance with the minimum waste analysis requirements of the respective receiving facility.

5.2.2 Archaeological Artifacts

A licensed archaeologist will be present on the 8801 property anytime soil is excavated or removed from the subsurface of the 8801 property as part of the remedial action. This includes but is not limited to excavations and well installations. The archaeologist has prepared an IDMP detailing the required actions. The Department of Archaeology and Historic Preservation (DAHP) approved the IDMP in an email dated January 4, 2021. The IDMP and approval email from DAHP are presented in Appendix C.

5.2.3 Excavation Performance Monitoring

Confirmation soil samples will be collected from the sidewalls and bottom of each remedial excavation. In addition, sidewall and base samples will be collected from soil where signs of potential contamination are noted, if any. In shallow remedial excavations above the groundwater table, the four sidewalls and the bottom will be sampled. Generally, samples will be collected on 20-foot centers from the sidewalls and bottom of each remedial

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excavation with a minimum of one sample collected from each sidewall and base as outlined below:

- If the final excavation depth is 4 feet or less, a minimum of one sample from each sidewall will be collected within the contaminant horizon identified during previous investigations or as noted during field observation.
- If the final excavation depth exceeds 4 feet, a minimum of one sample from each sidewall will be collected from the center (or within the contaminant horizon) of each 3-foot-thick (or portion of each) vertical layer. The thickness of the individual sample layers may be reduced to allow for more even sample distribution or accommodate field observations. For example, two samples from each sidewall when the excavation depth is 8 feet.
- Regardless of the total depth of the excavation, one sample from each fill layer observed in the excavation will be collected. This may require collection of additional sidewall samples.
- Bottom samples will be collected on a 20-foot grid in excavations where groundwater is not encountered.
- When groundwater is encountered during the excavation, the lowermost sidewall sample will be assumed to represent conditions at the water table.

In excavations where the base is likely to be below groundwater, borings will be used to collect base confirmation samples in advance of the excavation work. Borings are being used to collect base samples because most of the excavations that extend below the water table are within the tidal zone and will not be completely dewatered due to the constant tidal influx. Samples from borings can be used to target the proposed excavation depth more accurately than samples collected from an open excavation. Where borings are used to collect pre-excavation base confirmation samples, borings will be placed in locations where the maximum excavation depth is expected to be achieved. Soil samples will be collected from the borings at the targeted excavation depth and 1 foot above and 1 foot below the targeted depth. The sample collected from the targeted depth will be analyzed first for the COCs applicable to the excavation area. If the COCs in the sample are below the applicable CUL or RL, then the shallower sample will be analyzed, and if any of the COCs in the sample are above the applicable CUL or RL, then the deeper sample will be analyzed. The shallowest sample in which all relevant COCs are below the applicable CUL or RL will constitute the confirmation base sample for the excavation. The pre-excavation base sampling was conducted in February 2021. The results of the sampling are described in the EDRs for the remedial excavations.

Each remedial excavation will have a unique sampling suite dependent upon the COCs present in the excavation. Figure 4 shows the location of the remedial excavations. Table 7 details soil sampling by each remedial excavation.

The goal of the remedial excavations is to remove soil containing excavation-specific COCs at concentrations above RLs, except in the shallow/near surface portion of Area 5 where the CULs for cadmium and chromium will be used to determine the excavation limits, and in Areas 7 and 8 where the CUL for gasoline-range hydrocarbons will be used to determine excavation limits. Sample results will be used to extend the excavation if one or more excavation-specific COCs that exceed the RL/CUL as relevant are identified. The list below details the excavation-specific COCs for each remedial excavation.

Below are summaries of the planned remedial excavations, identifying the sampling that will be conducted in each area to confirm the lateral and vertical limits of each remedial excavation. The summaries call forward the results of the pre-excavation sampling conducted in February 2021 where they influence the sampling that will be performed in the field at the time of the remedial excavations.

Area 1 - Northern Property Boundary: This remedial excavation is designed to address TCE in shallow soil in the unsaturated zone. The excavation will be protective of groundwater by removing soil that has the potential to leach TCE into the groundwater table. Soil is proposed to be excavated to a depth of approximately 4 feet bgs, but the excavation may be extended to groundwater to allow for additional removal of TCE-impacted soil from the unsaturated zone if the base contains obvious visual or olfactory indications of elevated concentrations of TCE. Once the excavation extents have been achieved, samples will be collected from the sidewalls and the base of the excavation unless the base of the excavation is in contact with groundwater (in which case no base sample will be collected). The samples will be analyzed for TCE, PCE, and vinyl chloride.

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Area 2 - H4 Area and Vicinity: This remedial excavation is designed to address total cPAHs that exceed the TEQ in shallow soil (1.5 feet bgs) in the unsaturated zone. Soil will be excavated to a depth of approximately 2.5 feet bgs. Samples will be collected from the sidewalls and the base of the excavation, unless the base of the excavation is in contact with groundwater, in which case no base sample will be collected. The east sidewall may not be sampled unless signs of potential contamination are noted as that is backfill material from the previous H4 excavation. The samples will be analyzed for cPAHs.

Area 3 - E7 and Vicinity: This remedial excavation is designed to address PCBs, copper, and gasoline-range hydrocarbons in shallow soil (2 to 3 feet bgs) in the unsaturated zone. The initially targeted depth of the excavation is approximately 6 feet bgs. The area surrounding

DG11-11 and DG11-12 will first be excavated to 6 feet bgs. The excavation will be stepped out based on visually obvious indications of contamination, such as beige and green putty-like material that was encountered in a remedial excavation of similar COCs on the south adjacent property. Samples will be collected from the sidewalls and base of the excavation and analyzed for PCBs, copper, and gasoline-range hydrocarbons.

Area 4 - DG11-1 and Vicinity: This remedial excavation is designed to address PCBs and dioxins/furans in shallow soil (3 to 4 feet bgs) in the unsaturated zone and copper in deeper soil (up to 8 feet bgs) in the unsaturated zone and potentially saturated zone. Based on the pre-excavation base sampling conducted in February 2021, the excavation will extend to a maximum depth of 8 feet bgs. Samples will be collected from the east, north, and south sidewalls of the excavation and analyzed for PCBs and copper. The west sidewall of the excavation will not be sampled unless signs of potential contamination are noted because the soil in this location consists of clean material imported to backfill a former stormwater vault excavation, and the base of the excavation will not be sampled because confirmation base samples were collected in February 2021.

Area 5 - Southwest Storage Area: This remedial excavation is designed to address lead, arsenic, cadmium, and chromium in shallow soil (1 to 5 feet bgs) in the unsaturated zone and PCBs and lead in deeper soil (6 to 11 feet bgs) in the unsaturated and saturated zone. Based on the pre-excavation base sampling conducted in February 2021, the excavation base will be 11 feet bgs except at the location of MW-43A where the excavation will extend to 12 feet bgs. Samples will be collected from the north, east, and west sidewalls of the excavation in shallow soil (1 to 5 feet bgs) and analyzed for lead, arsenic, cadmium, and chromium. Samples will be collected from the north, east, and west sidewalls of the excavation in deeper soil (5 feet to 11 ft bgs), and analyzed for PCBs and lead, except no sidewall samples will be collected at depths that are in below the groundwater table. The south sidewall of the excavation will not be sampled unless signs of potential contamination are noted because the soil in this location consists of clean material imported to backfill a former stormwater vault excavation. The base of the excavation will not be sampled because confirmation base samples were collected in February 2021.

Area 6 - SFA-S15-3: This remedial excavation is designed to address arsenic in unsaturated soil at one sample location. The excavation is expected to extend to a depth of approximately 6 feet bgs. Samples will be collected from the sidewalls and base of the excavation. The samples will be analyzed for arsenic.

Area 7 - FWW-1: This remedial excavation is designed to address gasoline-range hydrocarbons in shallow soil at one sample location. This excavation is expected to extend to a depth of 9 feet bgs and into the groundwater. Samples will be collected from the

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sidewalls of the excavation and analyzed for gasoline-range hydrocarbons. The base of the excavation will not be sampled because a confirmation base sample was collected in February 2021.

Area 8 - A1: This remedial excavation is designed to address gasoline-range hydrocarbons in saturated soil (7 to 12 feet bgs). Based on the pre- excavation base sampling conducted in February 2021, the excavation will extend to a maximum depth of 10 feet bgs. Samples will be collected from the sidewalls of the excavation and analyzed for gasoline-range hydrocarbons. The base of the excavation will not be sampled because a sample was collected from this depth in February 2021. Vertical expansion of the Area 8 excavation is not possible due to existing infrastructure, and lateral expansion also is constrained by existing infrastructure. For this reason, this excavation is likely not to be expanded as discussed in the relevant EDR.

Except in Area 8, if a sample exceeds the RL as discussed above, then the area represented by the sample will be over-excavated a minimum of 1 additional foot, and subsequently resampled and tested for the COC with the RL exceedance. This procedure will be followed until the RL for that COCs has been attained or logistical or practical constraints (e.g., underground infrastructure) limit the excavation. If confirmation samples collected at or near the water table exceed RLs, nonaqueous-phase liquids are encountered, or field observations or previous sample results suggest that impacts extend beyond the water table, the vertical limits of the excavation may be extended below the water table to remove contamination above RLs; however, pre-base sampling and vertical delineation indicates that the RLs are not exceeded below the water table at most locations.

For CULs, but not for RLs, samples will also be evaluated to determine if the statistical test is met per WAC 173-340-740(7).

Except as otherwise indicated in Section 5.2.3, soil with concentrations exceeding one or more RLs will be removed unless such removal endangers the structural integrity of infrastructure, shoreline protection, or a building, in which case an engineering analysis will be provided to demonstrate the hazard.

Other excavation details such as dewatering and shoring are provided in EDRs.

5.2.4 Groundwater Performance Monitoring

Groundwater performance monitoring samples will be collected after remedial activities have been performed to verify that the concentrations of COCs are declining and that remedial actions are effective. Groundwater performance monitoring flowcharts are presented in Figures 5 and 6.

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Groundwater samples will be collected from groundwater monitoring wells located downgradient of the remediated areas following completion of the remedial excavations and groundwater treatment. The locations of the proposed compliance and performance wells are shown in Figure 3. The proposed wells to be sampled for performance monitoring and the selected analyses are provided in Table 4. The performance wells were selected to be close to each remedial area, ensuring that performance monitoring will be effective within the sampling timeline.

Groundwater samples will be collected four months after completion of the Area 1 remedial excavation and ERD injections to assess halogenated VOCs in groundwater. The performance monitoring well locations are within and downgradient of the proposed injection area. Samples will be analyzed for halogenated VOCs to determine if the RLs for TCE and vinyl chloride have been achieved. Natural attenuation parameters will be analyzed at the same frequency as halogenated VOCs in three monitoring wells: one near the east of the plume, and two mid-plume near the border of the ERD injection area to help determine if subsurface conditions are remaining favorable for the degradation of halogenated VOCs as discussed in Section 3.3. Natural attenuation parameters include methane, ethane, ethene, manganese, nitrate, nitrite, chloride, sulfate, sulfide, and ferrous iron. A VOC performance monitoring flowchart is provided in Figure 5. The groundwater data collected from the performance wells will be assessed for the risk of vapor intrusion.

Four months after completion of the ERD remedial injection for groundwater in the northwest area, samples will be collected from performance monitoring wells MW-44A and IT-MW-7. Samples will be analyzed for total petroleum hydrocarbons (TPH) and VOCs to determine if CULs have been achieved. Performance monitoring for the northwest area is also shown in Figure 5.

Verifying remedial activities for the area where PCB containing caulk will be removed will consist of sampling performance monitoring wells MW-16A and MW-34A for PCBs. A PCB performance monitoring flowchart is provided in Figure 6.

5.2.5 Performance Monitoring of Sub-Slab Vapor in Proposed Warehouse

Following construction of the proposed new warehouse, air samples will be collected to measure whether the sub-slab depressurization system is effective. The warehouse will have a sub-slab vapor depressurization system, which is detailed in an EDR. As a part of the design, sub-slab vapor will be routed through vent pipes to the roof of the warehouse. The vent pipes will contain sampling ports which will be utilized to collect samples. Baseline sub-slab vapor samples will be collected from five of the available sampling ports. The baseline samples will be analyzed for halogenated VOCs.

Quarterly monitoring will be undertaken from five sampling ports and analyzed for halogenated VOCs. After one year, if there is a significant decline (greater than 1%) in concentrations, monitoring will reduce in frequency to semi-annual.

Sub-slab vapor monitoring will cease when four consecutive events indicate TCE and vinyl chloride concentrations in both (1) groundwater immediately adjacent to the warehouse building and (2) sub-slab vapor samples, are below the upper value protective of indoor air for that media.

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5.2.6 Performance Monitoring of the Suitability of Imported Fill Material and Compaction

Imported fill will be tested for geotechnical properties to confirm its structural integrity for future development and analyzed for select COCs. Fill will be tested to ensure that no PCBs or TPH are present at detectable levels and that cPAHs, lead, arsenic, and copper do not exceed the CUL. A minimum of one sample from every type of material or every 5,000 tons will be tested. Samples failing geotechnical performance criteria or showing exceedance of any analyte will be rejected. Soil performance monitoring is detailed in Table 7.

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Compaction testing of the fill will also be performed. The compacted fill will be tested so that a minimum of 95% of the maximum dry density, as determined by ASTM D1557, is achieved. The moisture content will be monitored during placement and compaction of the fill.

5.2.7 Performance Monitoring of Air Sparge/Soil Vapor Extraction (AS/SVE) Groundwater Treatment Systems

Performance monitoring of the AS/SVE groundwater treatment systems will involve monitoring of the AS/SVE systems' input and output parameters to ensure the systems are functioning as designed and to allow modifications to increase the systems' effectiveness. Some of the monitoring parameters include measuring flow rates and relevant VOC concentrations and will be fully documented in a subsequent Operation and Maintenance Manual for the system.

5.2.8 Performance Monitoring of Enhanced Reductive Dechlorination (ERD) Groundwater Treatment Systems

Performance monitoring of the groundwater injection treatment systems will involve monitoring of the injection systems' input and output parameters to ensure the systems are functioning as designed and to allow modifications to increase the systems' effectiveness. The monitoring parameters are identified in an EDR.

5.3 Groundwater Confirmation Monitoring

Groundwater samples will be collected from the compliance wells along the western boundary of the 8801 property to determine if CULs have been achieved. The proposed wells to be sampled and the analyses are provided in Table 5. The selected wells include MW-50A, a new well that will be installed in the southwest corner of the 8801 property, and the well on the property adjacent to the north, IT-MW-7. These wells are located adjacent to the POC for groundwater and will be sampled on a quarterly basis for the two years after active remediation has been completed (refer to Table 5 for the complete list of compliance monitoring wells). The frequency of monitoring will then be assessed in coordination with Ecology. The quantity and range of analysis will be reduced as the analytical results meets the criteria laid out in Figure 7 and defined below.

Sampling will be reduced as follows:

- If a COC concentration is below the CUL for the final four consecutive quarters of the eight-quarter events, it will be removed from that monitoring well or the program, as relevant. A COC may also be removed if statistical cleanup requirements are met per WAC 193-3401-720(9)(e) and (f).
- If total PCBs concentrations are non-detect at a PQL that is practical (meaning a low-level method of analysis is used but not a congener analysis) for six consecutive quarters of PCB aroclors sampling, followed by two quarters of PCB congener homolog sampling, then the analysis will be removed from that monitoring well or the program, as relevant. Because detections will be identified with the PCB congener homolog analytical method and those concentrations are likely to be above the CUL, the results will be compared to the PCB aroclor PQL being used at that time. Total PCBs analysis may also be removed from a monitoring well or the program, as relevant, if statistical cleanup requirements are satisfied after a minimum of eight quarters of monitoring per WAC 193-3401-720(9)(e) and (f).

In advance of the five-year review by Ecology, sampling from the set of compliance monitoring wells will be undertaken and groundwater analyzed for the relevant site COCs. The sampling schedule for the five-year review may be reduced based on discussions with Ecology.

5.4 Groundwater Monitoring Well Network Modifications

The existing groundwater monitoring well network is proposed to be heavily modified due to redevelopment of the 8801 property. The modifications are shown in Figure 2 and are detailed in Table 6. The modifications are as follows:

- In advance of construction for the proposed new warehouse, 39 monitoring wells will be decommissioned. Three recovery well have also been used historically on the 8801

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property, one of these has been located and will be decommissioned. The remaining two recovery wells may have been previously decommissioned, if not, they will be decommissioned if construction activities expose the well locations. Compliance monitoring wells along the western boundary of the 8801 property, adjacent to the LDW will not be decommissioned. Wells will be decommissioned in accordance with all applicable requirements and WAC 173-160-381.

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- After approximately eight months of construction, 14 new monitoring wells will be installed. The installation schedule will be coordinated with the construction activities to avoid newly installed monitoring wells potentially being damaged by ongoing construction work. Eleven of the new wells will replace decommissioned wells and will be used for performance monitoring, and one new well will be installed and used for compliance monitoring (MW-50A), as shown in Figure 3. Two replacement monitoring wells (MW-18A(R) and MW-1A(R)) will not be utilized for performance or compliance monitoring but are being installed to replace existing wells that have been utilized during previous investigations and may be used in the future.

Replacement monitoring wells will be constructed to the same depth and screened in the same portion of the aquifer as the well which is being removed. Replacement wells that will be utilized for performance or compliance monitoring are shown in Figures 2 and 3.

5.5 Schedule for Implementation

It is anticipated the remedial excavations and the first injection event would occur within one year after Ecology approves the EDRs for the remedial actions at the 8801 property. Performance monitoring will then be used to determine whether additional injections are required. At least one ERD injection is required for the main part of the plume, and up to two ERD injections may be required in the northwest corner. Compliance monitoring will then commence. If required, additional injections will likely be undertaken within one to three years after the initial injections.

5.6 Contingencies

This section discusses the decision points to determine if additional soil and/or groundwater remedial actions are required after the proposed remedy has been implemented. As previously discussed, groundwater monitoring is being used to assess the performance of the remedial actions and to establish whether the RAOs and CULs are being met. The RAOs are to protect current and future worker exposure to soil contaminants, to protect occupants of future buildings, allow for landscaping to be established within the 100-foot river buffer; to protect the surface water and sediments of the LDW, and to achieve remediation of the halogenated VOC groundwater plume in a reasonable timeframe. The groundwater data

will be used to establish whether additional remedial actions are required and to assess the restoration timeline.

As previously discussed, soil confirmation samples will be collected to evaluate the effectiveness of soil excavations to the RLs in removing most of the COC mass in soil. Four of the excavations (Excavations 3, 4, 5, and 8) are close to the western boundary of the 8801 property. Groundwater for some of the COC concentrations from monitoring wells adjacent to these locations have exceeded their respective CULs. Excavation work is expected to disturb the soil and groundwater equilibrium resulting in temporary impacts to groundwater. Contaminants adsorbed to the finer soil particles may temporarily increase contaminant concentrations in total groundwater samples immediately after the excavation activities. Because it may take up to a year before this disturbance effect diminishes and the soil/groundwater equilibrium is restored, contingency actions will not be evaluated until after a minimum of four groundwater monitoring events associated with the excavation activities. Therefore, the timeline for consideration of actions associated with the excavation areas will be over a greater time-period than for groundwater remedial actions. Detection of chemicals associated with the laboratory's ability to achieve lower detection limits and consequently result in a detection where previous samples were non-detect are not considered applicable to the triggers discussed below.

Triggers and potential remedial actions that will be considered for soil commencing one year after completion of the excavations are:

- If total PCB aroclors are detected in groundwater in the compliance monitoring wells for more than three consecutive sampling events at concentrations greater than CULs and do not show a declining trend in concentration, a discussion with Ecology regarding additional alternatives will be undertaken. PCB aroclors in groundwater tend to be near the laboratory detection limit when analyzed so concentration fluctuations may be difficult to distinguish. In addition, PCB aroclor concentrations may fluctuate with the seasons, which could complicate identifying whether trends are declining. Ecology will determine whether the trend is declining based on all available data. Ecology may decide that additional data are required before the decision regarding trends can be made.

Within the halogenated VOC groundwater plume, the injected reagents have a designed lifespan of approximately two to four years and will impact groundwater both near and downgradient of the injection point. Triggers and potential actions that will be considered for the halogenated VOC groundwater plume after completion of the injections are:

- If the maximum concentration of TCE has not declined by 80% within three years and the geochemistry demonstrates that dechlorination is still occurring, re-injection of the ERD compounds or other stimulate compounds will be considered.

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- If vinyl chloride increases are greater than those predicted from the mass conversion of the remaining TCE or the concentrations stall, alternative injection substrates may be considered. These could include, but are not limited to, permanganate, peroxide, or persulfate.
- Since a large warehouse is proposed to be constructed over much of the 8801 property, including part of the halogenated VOC groundwater plume, some alternative injection points may need to be established to address on-going remedial actions. Once the warehouse has been constructed, if remedial action is still necessary (as discussed above), injection points will be placed alongside the exterior of the warehouse and wells downgradient of the warehouse will be monitored.
- On the western edge of the halogenated VOC plume, vinyl chloride is being addressed with the existing AS/SVE system and the proposed extension of the AS/SVE system. The northern and southern AS/SVE system wellfield legs of the existing AS/SVE system can be independently shutdown if CULs are achieved upgradient of these legs.

Triggers and potential remedial actions that will be considered for vinyl chloride and hydrocarbons in groundwater in the northwest corner of the 8801 property after completion of the injections are:

- If vinyl chloride concentrations in groundwater exceed the CULs at MW-7A (upgradient) and MW-44A (within the injection area) after three injection periods (if three injections are undertaken as they may not all be required), consideration of other options, such as alternative injection compounds, will be discussed with Ecology.
- If hydrocarbon concentrations in groundwater exceed the CULs at MW-44A after three injection periods (if three injections are undertaken as they may not all be required), consideration of other options, such as alternative injection compounds, will be discussed with Ecology.

6 LIMITATIONS

This report was prepared exclusively for PACCAR by Shannon & Wilson. The quality of information, conclusions, and estimates contained herein are consistent with the level of effort involved in our services and based on (a) information available at the time of preparation; (b) data supplied by outside sources; and (c) the assumptions, conditions, and qualifications set forth in this report and our proposal. This report is intended to be used for the 8801 property only, subject to the terms and conditions of the contract. Any other use of, or reliance on, this report by any third party is at the sole risk of that party.

7 REFERENCES

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APPENDIX A: SAMPLING AND ANALYSIS PLAN

Appendix A

Sampling and Analysis Plan

APPENDIX B: HEALTH AND SAFETY PLAN

Appendix B

Health and Safety Plan

APPENDIX C: ARCHAEOLOGICAL WORK PLAN

Appendix C

Archaeological Work Plan

IMPORTANT INFORMATION